REDUCTION OF THE LIQUIDATION CYCLE

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by

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INTRODUCTION

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Massey Ferguson's North American Operations Unit which is part of the world wide Massey Ferguson Corporation is a manufacturer of farm machinery and industrial equipment with sales of approximately four hundred million dollars annually. These sales involve the North American Company in a sizeable cash collection function which is the subject of this project.

The present system of cash collection is being analyzed in this project because questions involving the efficiency of that system in terms of timing and cost exist. Cash is presently collected in the United States through fourteen collection banks, and is then transferred to concentration banks where the funds become available for company use. Including mail time from the customers, approximately four days of cash receipts are tied up in this process of collection which starts with the customer mailing his funds to the regional bank, and does not become complete until those funds become usable at the company's concentration bank.

Procedure

The procedure involved in the study placed emphasis on obtaining sufficient data about factors affecting cash receipts, bank charges and procedures and other factors necessary to properly analyze the present system and obtain information necessary for the development and testing of alternatives. The gathering of such data provides a model of the present system and thus the basis for the formulation of alternatives to it. The goal is the formulation of a model which provides the optimum number and location of banks and method of processing cash receipts that will minimize the overall cost to the company. Evaluation is made upon the criteria of (a) mail times, (b) bank float, and (c) bank charges as these factors are considered as central to the reduction of funds tied up in the collection process.

Definition of Terms

The following are definitions of terms used in the study:

1. Automatic Wire Transfer - the process of moving money between banks (usually between collection and concentration banks) on a scheduled basis through bank wire. Standing instructions are usually made to routinely wire transfer and funds above a stated minimum balance to a specified bank. Funds become available funds at the receiving bank on the date transferred (i.e. there is no float).

2. Availability of Funds - The quality or state of being usable (to invest, spend). Funds become "available" or "usable" funds after passing through the liquidation cycle.
3. City Bank - A bank within a local federal reserve clearing city.
4. Concentration Bank - A bank into which corporate funds are gathered for use (for disbursements, investment, to pay off loans, etc.). A central, or gathering bank.
5. County Bank - A bank outside a federal reserve city.
6. Depository Transfer Check - A non-negotiable, usually unsigned check payable only to a single corporate bank account in a designated bank. It is used to move funds to a concentration or payable bank. Funds become available funds after clearing the liquidation cycle.
7. Float - The difference between collected or available funds and the bank statement balance, caused by the bank's handling and collection time for checks deposited written on other banks. Uncollected bank funds.
8. Liquidation Cycle - The elapsed time from the mailing date of a customer's remittance to the date that the remittance becomes available funds at a payable or concentration bank. Liquidation cycle includes:
    (a) elapsed time from mailing date of the remittance until received by the company
    (b) elapsed time of processing the funds for deposit

(c) elapsed time due to bank float, caused by the bank's handling and collection process.

9. Lock-Box Banking - A method of remittance where customers mail their payments directly to a post office box. The bank makes periodic pick ups from the post office box and performs the cash processing functions for the company and credits the deposit to the company's account. Nature of service is often tailored to each company's needs.
10. Payable Bank - A bank against which disbursement checks are drawn, usually a large concentration bank.
11. Regional Bank - A local bank, usually located near a branch or regional sales office, into which daily receipts are deposited.
12. Uncollected Funds - Recently deposited checks drawn on other banks, not yet credited to the company's account.

The North American Operations Unit

Massey Ferguson is a world wide manufacturer of farm machinery, industrial and construction equipment, engines and related products. In total, the company manufactures in forty-two plants in fourteen countries. Counting associates and licensees, its products are made in fifty-nine plants in twenty-two countries. In 1969 it employed 49,000 people and sold its products in 182 of the total 218 countries in the world.[1]

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[1] E. P. Neufield, A Global Corporation, A History of the Development of Massey Ferguson Limited (Toronto: University of Toronto Press, 1969), pp. 249-289.

This world wide organization is directed by a relatively small corporate organization of approximately one hundred people. This organization, with the exception of senior people, has no line relationship with individual operations units. The North American Operations Unit, which has product responsibility in Canada and the United States, is consequently fairly independent in the development and execution of strategy which is designed to satisfy corporate policy guidelines. This is especially so because of the comparative size of this operations unit to the total corporation. In 1969 it accounted for $393.7 million of the total $1,043.4 million of corporate sales or 37.8 per cent.[1] This independent responsibility of the operations unit to achieve corporate goals allows for the identification of local problems and the implementation of corrective programs when necessary. An analysis of the liquidation cycle in the North American Unit, which is the subject of this project, is therefore reasonable in terms of the units ability to act upon the report's recommendations, and quite appropriate in terms of the position this unit finds itself in.

While the corporation is a world leader in many areas, the North American unit is not so well known. It is primarily known as a maker of small tractors and combines. Efforts are being made to correct this image through the introduction of high horse-power tractors. Additionally, the company is faced with the same problems and weaknesses faced by the entire farm machinery industry:

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[1] Ibid., 1969 Annual Report, p. 16.

1. Rising interest costs.
2. The need to change its way of doing business in order to meet the trend to larger and fewer farms.

Necessity and Cost of Cash Collection

The North American Company is attempting to capture a larger share of the market, which in turn will generate its own growth.[1] This growth focuses even greater attention upon the company's cash collection problem, which is particularly important during periods when the cost of money is high, as it is today.

Collection of cash receipts is important to the company because of the costs involved in the process. The funds which outstanding receivables represent provide the company with the life blood necessary to function on daily basis and enable it to grow over time. Uncollected, they are still usable to the company for these purposes, but only to a limited degree and at an expensive price. Money can be borrowed against the receivables from banks at the current prime rate (presently 8%) which is at best an unsatisfactory solution to ongoing cash problems. It, therefore, behooves a company to convert these receivables as fast as possible in order to avoid this cost. The conversion process does have a cost, however, and it is important that this cost be treated as any other operating cost of the company. The process of cash collection in

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[1] Ibid., pp. 249-289.

the farm machinery business is similar to that of any other business, in that the major areas of cost are:

1. Mail Time
2. Bank Float
3. Impressed Balances
4. Interest
5. Handling

Mail time is the time involved in the mailing of a customer's remittance to the company collection point. Firms will either centralize this collection point or establish regional points, as is generally the case in farm machinery. This regionalization in the farm machinery industry results from the fact that receipts usually come from small towns and farm communities, and hence result in extended mail time. Consequently, regional collection points are established in an attempt to lessen the time lag. This time consumption is costly insofar as it delays the liquidation of this asset, often requiring a company to enter the money market for operating capital.

Bank float is the dollar difference between collected or available funds and the bank statement balance. It is caused by the banks handling and collection time for checks deposited written on other banks. In essence it represents uncollected but due bank funds. Firms are required by the bank to maintain a checking balance equal to the average dollar amount of these uncollected funds.[1] Such balances are referred to as

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[1] J. S. Sinclair (ed.), Managing Company Cash, Studies in Business Policy (New York: National Industrial Conference Board, Inc., 1961), p. 99.

impressed balances and being demand deposits do not earn interest. Because of this, it is important that the company reduce the float time to a minimum, as this will reduce the balance requirement.

Interest often enters in as a cost because of the firm's need to have operating capital. In order to obtain such capital, firms find it necessary at times to enter the money market to borrow (at or near the prime interest rate). To the degree that the liquidation of receivables can be speeded up, this borrowing can be decreased. As is demonstrated later in this study, the effect in cost of borrowing is actually higher than the current prime interest rate because of the requirement to maintain a 15% compensating balance on deposit with the lending institution.[1]

Cash collection requires various clerical preparation functions to be performed in order to transfer receipts from the company to the collection bank. These functions hold for either a centralized or regional collection system. All receipts have to be opened and inspected for endorsement, prepared for deposit and deposited. This work is a necessary function and whether handled by the firm or contracted out to the collection bank it is an operating cost which must be contended with.

Summary

It has been the intent of this chapter to identify the general characteristics of cash collection and to present enough background on

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[1]The percentage of compensating balance is a negotiable item between the lending bank and the firm. A 15% balance, however, is fairly common and is the present requirement of Massey Ferguson, Inc.

Massey Ferguson to indicate that it is a firm of sufficient dynamics to probably warrant an investigation of its system. It is a firm which finds itself faced with problems similar to others in that its future growth requirements will require larger and larger amounts of money capital for both daily operations and investment. One source of money capital lies in its existing receivables, but the liquidation of this potential source of funds can be a costly process both directly and indirectly. Directly, in that the physical process of collection requires handling and time. Indirectly, in that the inability to collect these funds rapidly and efficiently could cause a firm to enter the money market for funds at high interest rates. It is important to note that these cost characteristics are not unique to the company in question but are rather of a universal nature. The following chapters will, however, detail the cash collection system of Massey Ferguson and investigate these cost characteristics as they apply. As a result of such an investigation, an evaluation of the system's effectiveness can be made and recommendations proposed.

CHAPTER II

THE PRESENT SYSTEM

In North America sales are made to franchised dealers through fourteen RSO's (Regional Sales Offices) in the United States and five branches in Canada. In addition, retail sales are financed through subsidiary finance companies in both countries. Both wholesale cash and retail cash are remitted directly to the RSO/branch locations. RSO deposits are made daily in local banks and transferred to concentration banks by means of automatic wire transfers, usually through a one day time lag. This system is illustrated by the diagram in Figure 1.

As an example consider the XYZ Farm Equipment Company. Settlement of a wholesale contract is initiated by the company upon completion of a retail sale. Remittance of the balance due amount on the contract is made by check which is sent through the mail to the local Retail Sales Office. From the time of mailing from the dealer's location to arrival at the RSO consumes approximately 1.5 days. This is illustrated by sections 1, 2 and 3 of Figure 1. Upon receipt at the RSO the XYZ Company's check is included in the daily bank deposit and the Cash Receipts report for Head Office. The daily deposit is made at the local Regional Bank while the total dollar amount of the Cash Receipts report is teletyped to Head Office in Des Moines. These actions which are accomplished on the same day of mail receipt are illustrated by sections 4 and 5 of

Figure 1. Upon receipt of the daily deposit by the Regional Bank two actions are taken. All checks not written on the Regional Bank are forwarded to the Federal Reserve Bank for clearing. This process will require 2 to 2.5 days on the average before the checks are cleared and the funds become usable by the Regional Bank. This procedure is illustrated by sections 6 and 9 of Figure 1. The second action which is taken upon receipt of the daily deposit is for the Regional Bank to hold the funds for one day and then transfer them to Massey Ferguson's ledger account at the Concentration Bank. This process, which is accomplished via an automatic wire transfer and makes the funds available to Massey Ferguson one to one and a half days earlier than they become usable to the Regional Bank, is illustrated by sections 7 and 8 of Figure 1. This same procedure occurs for a retail sale which is financed through Massey Ferguson's subsidiary finance company. In such a case a retail finance contract is the receivable document against which payment is made and is handled in exactly the same manner as the wholesale remittance of the XYZ Farm Equipment Company described previously.

The Problem

To the extent that cash receipts are tied up in the liquidation cycle, the company has a permanent reduction of usable funds. To the degree that the liquidation cycle can be reduced, cash availability is increased. Under the present banking structure it is estimated that one and a half day's receipts remain in transit through the mails and an

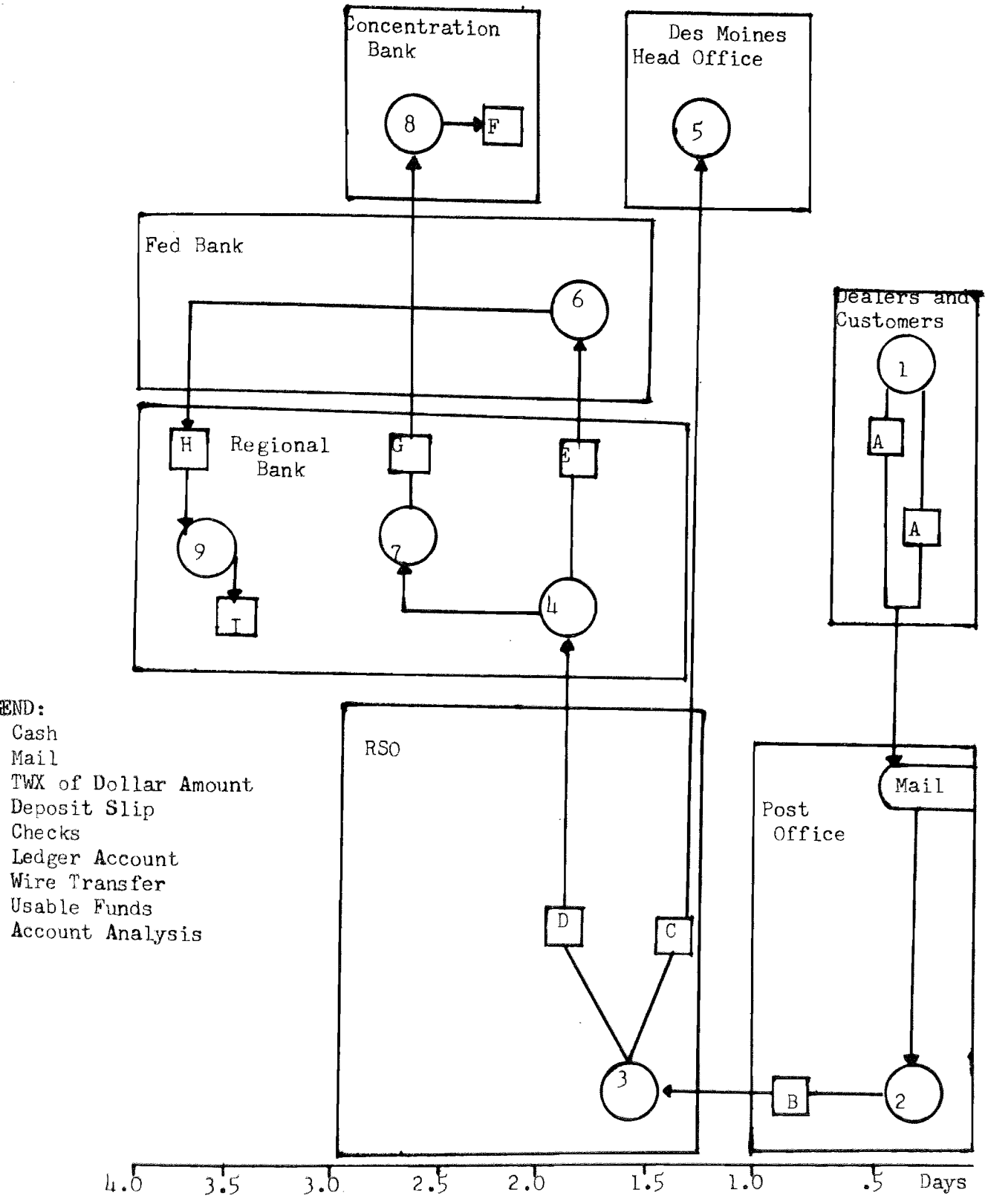

Figure 1. Present Bank System

additional two and a half day's receipts represent float outstanding at the RSO/branch banks. Approximately $2,100,000 of predetermined balances are required by the fourteen U.S. RSO banks to cover float on the deposited items and to reimburse them for their services.[1]

A recent company decision to centralize the accounting function (exclusive of cash processing) of the RSO's at the head office and the recent high interest costs, would tend to indicate that a review of the present banking structure, through which the company processes cash receipts, is warranted.

The intent of this research project is the formulation of a banking model to determine the optimum number and location of banks and method of handling and processing cash receipts that results in a minimum overall cost to the company. The study includes both wholesale and retail cash. Canada, due to the satisfactory geographical locations of present branch banks, the difficulty in obtaining data and its relative size in relation to U.S. sales, has not been included in this study.

The study includes the evaluation of various bank configurations, utilizing both lock box cash deposits and company processing of cash receipts. The use of central cash collection was eliminated after only preliminary study as being too inefficient.[2] The use of automatic wire transfers is used in all alternatives as being faster and more dependable than bank transfer checks.

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[1] See Appendix E for detail.

[2] This is mainly because of the extended mail time from the remote location of the Company's customers.

Information from three basic sources was required: (1) Company accounting and treasury records, (2) banks considered in the study, and (3) other secondary sources. From the accounting and treasury records, information was secured as to the number and amount of cash receipts by geographical area, information as to banks utilized by the company, their balances and charges and analysis of company cost of cash processing under the present banking arrangement. From banks considered in the study it was necessary to obtain the individual earning rates, reserve requirements, charges for services presently utilized, as well as their lock box rates. Other data, such as their basis for computing bank float and information available on lock box studies, was also secured from the individual bank. In addition, articles and books written on cash management and lock box banking were needed for background material, and mail time and bank float arrangements information was necessary in order to formulate the model.

The research approach has, to a large degree, been descriptive, in that most of the data obtained were used either to explain the present system or to furnish information about alternative approaches. After all research data were accumulated and alternatives fed into the model, the various results were compared to determine the relative merits of each.

The first step undertaken was the collection and analysis of data. The method and extent of information gathering is discussed below.

Primary Sources of Information

Analysis of retail cash receipts. The company's retail receivables are maintained through a central computerized system, making data retrieval fairly easy. The information obtained included:

1. Cash receipts broken down by RSO by month. This information was summarized from the monthly cash receipts entry to the general ledger.
2. Average dollar amount and number of cash receipts by month. As part of the retail system, a report is prepared showing the total number and amount of cash receipts by month. This information was available in total only.
3. Cash receipts, by state by RSO. This was somewhat more difficult to obtain. An annual report prepared for tax purposes was used which lists receivables as of the end of the fiscal year (October 31) by state for each RSO. (Actually the report is broken down to show both the state of the dealer and that of the customer. Since the cash receipts originate from the customer, only that portion of the report was used.) The percentage of each state to the total receivables for each RSO was computed and applied to the actual retail cash receipts by RSO to arrive at a computed amount for each state. The number of cash receipts was allocated back to each state on the same basis.

Analysis of wholesale cash receipts. The wholesale receivables are on a manual basis, although centralized at the Head Office, making information retrieval more difficult. Methods used to obtain data were:

1. Cash receipts, broken down by RSO by month. This information was summarized from the monthly cash receipts entry, as above.
2. Average dollar amount and number of cash receipts by month. This information is not available as part of the system. To obtain it, a sample was chosen using five RSO's, selected from among the larger RSO's including at least one from each of the company's three divisions. Daily deposit tickets were available for each RSO. For each month three days were chosen: the second Monday, the third Wednesday and the last working day. The sample taken included both the amount and number of cash receipts for the days and RSO's tested. From the sample an average dollar amount was computed for each month, and by application to total cash receipts the total number of cash receipts by month was computed.
3. Cash receipts by state by RSO. An Annual report is prepared for each RSO recapping total dealer settlements by state eligible for volume discounts. A memo column is also added listing total parts sales. After summarizing total eligible settlements plus parts sales by state within each RSO, the percentage of each state to the total for each RSO was calculated.

This was then applied to total wholesale cash receipts, in the same manner as was done for retail receipts above, to arrive at a computed number and amount of cash receipts by state by RSO.

Recap of cash receipts by RSO and by state. Cash receipts data for retail and wholesale were accumulated (a) by state within RSO and (b) by state. The listing by state is presented in Table I at this time to give some idea of the vast area diversification faced by Massey Ferguson in the collection of cash receipts.

Analysis of bank charges. Each bank was requested to submit a monthly account analysis showing their profitability on the company's bank accounts. The format of these reports is as follows:

1. Average ledger balance
2. Less Float
3. Average collected balance (1 minus 2)
4. Less reserve requirements
5. Average loanable balance (3 minus 4)
6. Annual earnings rate
7. Earnings on account (5 times 6 divided by 12)
8. Expenses:
   A. Items deposited (Number of items deposited times deposit charge per item).
   B. Ledger entries (Number of ledger entries times charge per item).

C. Wire transfer charges (Number of wire transfers times charge per wire).

D. Maintenance charge.

E. Other charges (Charges for number of deposits, NSF checks, stop payments, etc.).

9. Profit or Loss on account (7-8)

The method of calculating float, reserve requirements, earnings rate and charges for services all vary by individual bank. For this reason, all account analyses were summarized for each bank and the current rates used were noted.

Analysis of bank float. Total cash receipts were summarized for each RSO by month and an average day's receipts were computed. This was then compared to the average float as determined by the banks' account analyses. The number of day's float outstanding was then computed for each month and in total for the year (or period in which account analysis was available).

Several of the banks were, also, asked about their method of computing float and this was found to vary considerably. Some banks used annual samples of a few days deposits, some computed float daily on large items, some computed actual float daily, and a few of the smaller banks assumed a three day float. Appendix C explains the basis upon which float is determined.

Analysis of number of cash receipts by RSO. The average amount of cash receipts by month and the total for the year were divided into total

TABLE I

ANALYSIS OF CASH RECEIPTS BY STATE[1]
1969

Rank	State	#C/R	Annual Amount 000 (omitted)	Avg. Day's Receipts	Avg. Business Day's Receipts
1	Illinois	15,399	$14,947	$40,951	$60,270
2	Iowa	9,489	14,649	40,134	59,069
3	Texas	14,773	14,508	39,750	58,500
4	Missouri	10,034	11,016	30,181	44,419
5	Tennessee	8,483	10,987	30,101	44,302
6	North Carolina	9,018	9,739	26,682	39,270
7	Ohio	8,178	9,313	25,515	37,552
8	Indiana	7,680	8,728	23,912	35,194
9	Georgia	7,509	8,112	22,225	32,710
10	Arkansas	6,289	7,997	21,910	32,246
11	Kentucky	5,653	7,267	19,910	29,302
12	Minnesota	4,032	6,741	18,468	27,181
13	Kansas	5,712	6,643	18,200	26,786
14	Mississippi	4,995	6,466	17,715	26,073
15	Nebraska	4,124	5,959	16,326	24,028
16	Michigan	5,031	5,731	15,701	23,109
17	Wisconsin	4,502	5,484	15,025	22,113
18	Oklahoma	4,798	5,375	14,726	21,673
19	California	3,708	5,326	14,592	21,476
20	New York	9,267	5,168	14,159	20,839
21	Alabama	4,450	5,160	14,137	20,806
22	Pennsylvania	8,106	5,141	14,085	20,730
23	Virginia	8,043	4,763	13,049	19,206
24	South Carolina	3,946	4,262	11,677	17,185
25	Florida	3,629	3,919	10,737	15,802
26	North Dakota	2,270	3,788	10,378	15,274
27	Louisiana	2,816	3,643	9,981	14,690
28	Idaho	3,473	3,192	8,745	12,871
29	Colorado	2,964	3,044	8,340	12,274
30	South Dakota	1,753	2,902	7,951	11,702
31	Maryland	4,227	2,387	6,540	9,625
32	Washington	2,377	2,184	5,984	8,806
33	Montana	1,311	2,182	5,978	8,798
34	Oregon	1,875	1,723	4,721	6,948
35	W. Virginia	1,530	1,581	4,332	6,375
36	Wyoming	1,253	1,264	3,463	5,097
37	Utah	1,227	1,235	3,384	4,980
38	Vermont	2,083	1,165	3,192	4,698
39	Delaware	1,766	997	2,732	4,020
40	Arizona	664	933	2,556	3,762

[1]Data presented in this table are the result of research on wholesale and retail cash receipts. This research described on pages 16-18 of this study.

TABLE I (continued)

Rank	State	#C/R	Annual Amount 000 (omitted)	Avg. Day's Receipts	Avg. Business Day's Receipts
41	New Jersey	1,523	$860	$2,356	$3,468
42	Massachusetts	1,265	709	1,942	2,859
43	New Mexico	598	611	1,674	2,464
44	Maine	953	531	1,455	2,141
45	Connecticut	706	395	1,082	1,593
46	New Hampshire	515	287	786	1,157
47	Nevada	58	79	216	319
48	Hawaii	51	73	200	294
49	Alaska	5	5	14	20
		$214,111	$229,171	$627,870	$924,076

cash receipts for each RSO for both wholesale and retail receipts to arrive at a computed number of cash receipts for each RSO by month. The total receipts for each RSO as computed were then compared to the number of deposited items per the bank account analysis, where available, and variances were computed. Variances on both a monthly and an annual basis were such as to indicate that the average dollar deposit per individual RSO varied considerably. Based on the account analysis available for each RSO, a correction factor was developed by dividing the total number of deposited items for the period available by the computed number of cash receipts, using the annual rates. The annual number of deposits for each RSO, calculated as discussed above, was then adjusted by the correction factor to arrive at an adjusted number for each RSO. The total number of cash receipts after applying the correction factor was 214,111 compared with 214,046 before, thus establishing the overall acceptance of this approach.

Calculation of interest cost. The company's short term borrowings are usually at or near the prime interest rate (currently 8%). In addition to the interest cost, a 15% compensating balance is required which must also be considered a cost of borrowing. As calculated in Table II, the current effective interest rate is approximately 10.3%.

Calculation of company cost of processing cash receipts. All mail received by the RSO in the morning is included in the current day's bank deposit, which is usually made around noon. The cash work performed by the RSO includes opening the mail, inspecting and endorsing checks, preparing detailed mail listing for all retail receipts, running adding machine tapes

TABLE II

CALCULATION OF EFFECTIVE INTEREST RATE

Money borrowed on 90 day notes at prime rate

15% Compensating balance required

90 day note	$1,000,000	
Calculation of interest expense ($1,000,000 x .085 x $\frac{90}{360}$)		21,250

Funds available for use during period

Amount borrowed	$1,000,000
less 15%	150,000
	850,000
less Interest	21,250
Net funds available	$ 828,750

Calculation of Effective Rate

Annual interest cost	85,000	=	10.3%
Net funds available	$ 828,750		

of wholesale and retail receipts, preparing deposit slip and the making of the deposits. Based upon the results of a company study, the average cost to the company is estimated at approximately 1,200 dollars of fixed costs for each location plus a $6\frac{1}{2}$ cents variable cost per check processed.[1]

Secondary Sources of Information

Determination of mail times. Three of the banks contacted had performed fairly extensive mail surveys covering mail times to principal money centers from principal industrial cities within the United States. Of the three, the one provided by the National Bank of Detroit was the most extensive, covering mail times from each of 144 cities to twenty-seven money centers. Results were summarized in a table showing the mean mail times to the nearest tenth of a day.

Since the firm in question is principally a farm equipment manufacturer, receipts usually come from small towns or farm communities, and hence should result in longer mail times than those resulting from the above survey. However, if mail times used in the model remain consistent for each alternate tested, this factor should not affect the overall consistency. The mail times as shown in National Bank of Detroit's survey were therefore used in the model with the following changes.

1. A mail time for each state was arrived at to each of the principal twenty-seven money centers by selecting that city within the state having the highest mail time.

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[1] I. F. Moore and R. M. Johnson, "Study and Evaluation of Alternatives for Conserving Retail Cash" (Company Study 1968).

2. Mail times in the study ranged from 1.0 day up. The lowest mean time considered in the model was 1.2 days (i.e. all times of 1.0 and 1.1 days were considered as 1.2 for analysis purposes).
3. Mail times for RSO cities not included as principal money centers were assumed to be the same as those of the nearest money center.

Calculation of lock box charges. Lock box service is tailored to fit individual customer needs and it was found difficult to get the individual banks to quote lock box charges (which are made on the basis of cost per document) without a thorough knowledge on their part of the nature and extent of non-cash items included with the deposit, the amount of information required by the company, as well as the size and volume of average daily deposits. Individual bank rates do vary considerably, however, as well as the extent of the services which they can perform for the company. Of the banks which did give some indication of their charges, a low of 4¢ per item to a high of 10¢-25¢ was found. Due to the reluctance or inability of banks to reveal this information, a standard rate of 15¢ per document was used for all banks, which includes an estimated 3¢ cost to the company for partial duplication of cash processing work already performed. This cost is considered conservative overall, but may result in some distortion between alternatives tested.

Cost comparison of lock box to company processing. As seen above, the use of lock box deposits is somewhat higher to the company than the use of company personnel. Lock boxes offer certain advantages, however.

1. Faster deposit. Cash received in the morning mail is deposited on the same day (around noon). Mail received subsequent to that time is included in the following day's deposit. Banks offering lock box services pick up the mail usually on an hourly basis during the day, as well as at night and during weekends.
2. Faster clearance of checks. Use of lock box facilities and major banks in principal money centers would also reduce float. All cash received by the lock box bank and processed in time to clear the Federal Reserve bank by 11:00 A.M. Central time results in one day less float. In addition, major banks have "cash letters" with other principal money centers, which also results in one day less float for checks written in those cities. Present deposits made at noon cannot clear the Federal Reserve bank until the following day. It is estimated that at least a half day's float can be saved by use of lock box facilities in Federal Reserve Cities.

Direct bank charges for services. Banks prefer their customers to maintain sufficient balances in their accounts to cover all charges for bank service rendered. Banks will, however, make direct charges to companies for services of a special nature, such as for automatic wire transfer charges and lock box charges, if insisted upon by their customer. Due to low earnings credit given by most banks in relation to present interest costs it is to the company's advantage to pay such charges direct. In the alternatives considered, it was assumed that wire transfer costs and lock box charges, when applicable, would in fact be paid in this manner.

Summary

An examination of the data affecting the cost of cash collection has been made here preliminary to the development of an algebraic expression in Chapter III which will facilitate the analytical process. Emphasis has been placed upon determining the average dollar amount, monthly quantity and location of origin of the Company's cash receipts. Knowledge of this information allows for the development of a model which has properly placed collection banks to take advantage of both the heavy customer populated area and the mail time survey. This done with an accurately predetermined cost based upon the cash receipt volume and information on both lock box and company cost of handling.

Thus having identified in detail the cost factors which affect the Company's cash collection process it is possible to express these factors in an algebraic expression for analytical examination of both the present system and possible alternatives.

CHAPTER III

ALGEBRAIC FORMULATION OF CASH COLLECTION MODEL

Based upon the information obtained as presented in Chapter II, the cost to the company of any banking structure was determined to consist of the sum of the following:

1. Interest cost of
   a. cash in transit from customers
   b. bank predetermined imprest balance, and
   c. additional cash left in bank due to delay in transforming funds through automatic wire transfers
2. Cash processing costs including both company cost and bank lock box service cost, and
3. Direct bank charges not included in 2 above.

Expressed in algebraic terms, the equation would be:

$$X = I\ (M + P + W) + C + D$$

Where: X = Total cost to company

I = Effective interest rate

M = Cash in transit, due to mail time

P = Bank predetermined balance

W = Cash in bank due to delay in wire transfers

C = Cash processing costs

D = Other bank direct charges

To solve the above equation it is first necessary to determine the values of "M," "P," "W," "C" and "D" for each of the banks used in the model.

Where $M = b \cdot t$ (for the total of all state areas assigned to the bank)

b = Average business day's receipts

t = Mail time

$$P \geq \frac{a(f-y) + z(n) + t + o}{e}$$

a = Average day's receipts

f = Bank float factor

y = Number of day's delay in wire transfer

z = Bank charge per deposit item

n = Number of annual cash receipts

t = Wire transfer costs (where included in computing predetermined balance)

o = Other bank charges (annual)

e = Bank effective earning rate (considering reserve requirement)

$W = a \cdot y$

$C = v(n) + u$

v = Variable cost per cash receipt

u = Other fixed costs

$D = t$ (where wire transfer costs are paid direct)

Summary

The purpose of the development of the algebraic model in this chapter has been to provide a tool for the necessary testing of both

the present collection system of Massey Ferguson and possible alternatives to it. This model enables the comparison of the tangible cost factors involved in alternative systems, and it is upon these factors that recommendations will be made. It is not the purpose here to attempt to measure intangibles as these must be measured by subjective evaluation of management and are in any case difficult if not impossible to quantify. Utilizing this tool then, the purpose of Chapter IV will be to examine and compare different models using cost as the ultimate measuring tool.

CHAPTER IV

ALTERNATIVES TO PRESENT SYSTEM

The purpose of this chapter is to examine alternative bank configurations capable of performing the cash collection function for Massey Ferguson. The alternatives presented here are representative of the many actually considered in the study, and have been selected for presentation because they appear to be the best possible alternatives to the present system. In reviewing these alternatives, it should be kept in mind that the major criteria of evaluation is cost. Each of the alternatives presented realize a cost reduction compared with the present system owing to three factors; (1) faster mail service, (2) the use of lock box remittances, and (3) reduction of the total number of banks in the system.

Mail time reduction results from the systematic location of collection banks in such a pattern that the most important states, in terms of collections, are allocated to cities providing the fastest mail service. Various mail surveys, updated on a periodic basis, are available for assistance in developing such a location pattern, and in this study the National Bank of Detroit's survey kit was used. By reducing mail time from the customer to the bank two things are accomplished which directly affect the cost of cash collection. First, float requirements at the collection banks are reduced which directly impacts the predetermined balance as explained in Chapter II. Secondly, the total cash in transit

at a given time is also reduced. To the degree that funds are tied up for these two purposes, they are unusable to the company for other purposes and thus constitute a cost of cash collection. That cost is measured by the amount resulting from application of the company's effective interest rate of 10.3% to the combined total of the predetermined balance and the cash in transit. For example, if the predetermined balance is $50 and the cash in transit is $50, the cost resulting to the company is 10.3% multiplied by $100, or $10.30. Thus, any reduction of the predetermined balance or the cash in transit will affect the cost of cash collection.

The use of lock box remittances was assumed in each of the alternatives tested after samples showed this to be less expensive than the present practice of RSO handling. Lock box services provided by collection banks transfer the handling and deposit of receipts from the company to the bank, charging for this service on a per item basis. As explained in Chapter II, banks are reluctant to quote lock box charges without a thorough study on their part of the nature and extent of a company's deposit requirements. Discussions with various banks indicated a range of lock box charges from a low of 4¢ per item to a high of 25¢. These discussions also indicated that the standard rate of 15¢ per item used in this study is a reasonable estimation considering Massey Ferguson's average number of receipts.

As stated, lock box remittance was assumed for all alternates developed after samples indicated this to be less expensive than company handling. An example of this is the second alternate presented which

found lock box remittances to be approximately $10,000 per year less expensive than company handling. The $10,000 savings results from the fact that bank predetermined balances would fall by $152,800 per year if billings were made on the lock box per item basis. This gives a $15,738 per year savings when the company's effective interest rate of 10.3% is applied. Direct bank charges would increase by approximately $5,400 per year, however, based upon the estimated 15¢ per item charge. Net savings are thus approximately $10,000 per year.

By reducing the number of collection banks in the system the company's aggregate predetermined balance can be reduced. If the banks are located in such a manner that average mail times are reduced, float will be impacted in a direct relationship. In addition, duplication of services can be held to a minimum which will reduce charges to Massey Ferguson.

Each of the alternatives presented in this chapter compare favorably to the present system on a cost basis. In each case this favorable comparison is a result of the three factors just discussed. The cost analyses for these alternatives, which are presented in Tables III through XVI in this chapter, were developed in a manner similar to the analysis for the present system. The present system cost analysis is presented in detail in Appendix E while the alternatives developed in this chapter are presented in summary form.

Alternatives Considered

Alternative Number One

From Table I in Chapter II the most important states in terms of receivables were plotted on a map (see Appendix A, Map I). The first alternative bank configuration was chosen based upon locating collection banks in the cities giving the best one day mail service to the shaded areas, which represent 79% of the receivables collected by the company in 1969. Cities used for location of collection banks were Atlanta, Cincinnati, Des Moines, St. Louis, Dallas and Portland. A cost analysis of this alternative is contained in Table III. Total cost compared to the present system is favorable by $53,300.

Alternative Number Two

The second alternative expanded coverage to include the top twenty-eight states which represent 90% of total cash collections. For these states, all principal money centers with mail service of:

1. 1.2-1.5 days
2. 1.6-1.7 days
3. 1.8-1.9 days

were listed. The number of states covered by each city in each category was tabulated. Where cities offered the same general coverage, the best of these were chosen (e.g. St. Louis, Chicago and Kansas City all offered mail service under two days for the same area, but St. Louis coverage in the 1.2-1.5 category included nine states, while Chicago includes only two and Kansas City four). Four cities (Detroit, Dallas, Memphis and St. Louis) were found to offer mail service to sixteen of these top

TABLE III

ALTERNATE 1

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Syracuse	$ 17640	$ 120000	$ --	$ 120000	$ 132100	$ 252100	$ 25800	$ 4900	$ 500	$ 31200
Atlanta	53408	195000	146300	341300	312700	645000	67000	7800	300	75100
Cincinnati	32620	155000	89400	244400	188100	432500	44300	4500	600	49400
Des Moines	33563	195000	92000	287000	203100	490100	50300	3600	300	54200
St. Louis	41609	195000	114000	309000	221500	530500	54400	6000	600	61000
Dallas	33068	190000	90000	280600	169100	449700	46100	4800	300	41200
Portland	17263	85000	--	85000	99600	184600	18900	2600	-	21500
	$229171	$1135000	$532300	$1667300	$1326200	$2993500	$306800	$34200	$2600	$343600

twenty-eight states in 1.5 days or less and nineteen in under 2.0 days. Coverage of the remaining nine states was under 2.5 days.

These four cities were chosen as Alternate 2, and a cost analysis of this alternate is presented in Table IV. The remaining alternatives presented in this chapter were developed by building onto or modifying the Alternate 2 model. Additional cities were included for location of a collection bank when it was found that the additional location reduced average mail time of the system. The Alternate 2 model was modified by substituting different cities for those of the Alternate 2 model, thereby redistributing the mail coverage. Cost analyses for these additional models are presented in Tables V through XVI and reflect the individual model's efficiency. Costs will decline as average mail time declines because of the float affect on predetermined balances, and application of the effective interest rate to total cash in transit. The counter balancing factor will be the number of banks in the system. While increasing the number of banks reduces average mail time and thus cost, each addition can also increase cost because of a duplication of services. The balancing process is achieved by the value of the total system cost of the various alternative models considered.

The remaining alternative models are presented below with a statement of their relation to the Alternate 2 model, and reference to their individual cost analysis. This method of presentation should allow the reader to logically follow the analytical process which was taken during this study and led to selection of the model eventually recommended.

TABLE IV

ALTERNATE 2

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Detroit	$ 59530	$285000	$163100	$448100	$388800	$ 836900	$85800	$ 9500	$ 300	$ 95600
Dallas	24850	145000	68100	213100	141400	354500	36400	4000	300	40700
Memphis	67450	330000	184800	514800	409000	923800	94700	9800	300	1048 00
St. Louis	77341	360000	211900	571900	459800	1031700	105700	101 00	600	1164 00
	$ 229171	$1120000	$ 627900	$ 1747900	$ 1399000	$3146900	$ 322600	$334 00	$ 1 500	$357500

Alternate 3A

Atlanta was added as a fifth city to the Alternate 2 model. The purpose here was to have Atlanta assume coverage of all states for which it provides better coverage than does Detroit, Dallas, Memphis or St. Louis. Refer to Table V for the cost analysis of this alternative which reflects a reduction of approximately $7,000 compared with Alternate 2. Average mail time reduction in this instance outweighs the cost of adding another location.

Alternate 3B

Atlanta was added as a fifth city to the Alternate 2 model. In addition to assuming coverage as in Alternate 3A it, also, covers those states for which it provides as good a coverage as any other Alternate 2 city. This alternate is cost analyzed in Table VI, and reflects a small reduction in cost over Alternate 3A. This reduction occurs because of the smaller amount of funds tied up as impressed balances owing to Atlanta's low float coverage requirement.

Alternate 3C

Atlanta is added as a replacement for Memphis. Coverage by Memphis in Alternate 2 is transferred to Atlanta or other Alternate 2 cities; whichever provide the best service. The cost analysis in Table VII reflects an increase in cost over Alternate 3B of $1,700 thus leaving the 3B model as the best considered thus far.

Alternate 4A

Minneapolis was next added to Alternate 3B to form a six location model to see if further cost reduction could be achieved. All states for

TABLE V

ALTERNATE 3A

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Detroit	$ 59530	$ 285000	$ 163100	$ 448100	$ 388800	$ 836900	$ 85800	$ 9500	$ 300	$ 95600
Dallas	24850	145000	68100	213100	141400	354500	36400	4000	300	40700
St. Louis	77341	360000	211900	571900	459800	1031700	105700	10100	600	116400
Memphis	41415	205000	113400	318400	224200	542600	55600	6200	300	62100
Atlanta	26035	85000	71300	156300	150100	306400	31400	3900	300	35600
	$ 229171	$ 1080000	$627800	$1707800	$1364300	$3072100	$314900	$33700	$1800	$350400

TABLE VI

ALTERNATE 3B

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Detroit	$ 59530	$ 285000	$ 163100	$ 448100	$ 388800	$ 836900	$ 85800	$ 9500	$ 300	$ 95600
Dallas	24850	145000	68100	213100	141400	354500	36400	4000	300	40700
St. Louis	77341	360000	211900	571900	459800	1031700	105700	10100	600	116400
Memphis	29785	150000	81600	231600	165800	397400	407 00	4800	300	45800
Atlanta	37665	135000	103200	238200	208500	446700	45800	5300	300	51400
	$ 229171	$1075000	$ 627900	$1702900	$1364300	$3067200	$ 314400	$33700	$1800	$349900

TABLE VII

ALTERNATE 3C

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
St. Louis	$ 77341	$ 360000	$ 211900	$ 571900	$ 459800	$1031700	$105700	$ 10100	$ 600	$116400
Dallas	38910	220000	106600	326600	216100	542700	55600	6000	300	61900
Detroit	64280	310000	176100	486100	427300	913400	93600	10700	300	104600
Atlanta	48640	180000	133300	313300	288200	601500	61800	6600	300	68700
	$229171	$1070000	$ 627900	$1697900	$1391400	$3089300	$316 700	$33400	$ 1500	$351600

which Minneapolis provided better mail coverage than the cities of Alternate 3B were assigned to Minneapolis. An improvement in cost of $3,200 was achieved over Alternate 3B owing to a reduction in the average mail time. Refer to Table VIII for Alternate 4A's cost analysis.

Alternate 4B

Minneapolis was added to Alternate 3B assuming mail coverage for all states which it provides as good or better mail coverage than any city in Alternate 3B. This addition to Alternate 3B reflects a cost reduction of $3,200 because of reduced average mail time, or an equivalent reduction to that of Alternate 4A. Refer to Table IX for cost analysis of Alternate 4B.

Alternate 5A

Portland was added to Alternate 4A to form a seven location model to see if further cost reduction could be achieved. Portland assumed mail coverage for all states that received better coverage from it than any locations in Alternate 4A. The cost analysis of Alternate 5A contained in Table X reflects a reduction of $8,800 when compared to Alternate 4A. This was due to reduced average mail time.

Alternate 5B

Portland was added to Alternate 4A assuming mail coverage in all states for which it provided as good or better service than any city of Alternate 4A. The cost analysis presented in Table XI developed the same reduction in cost compared with Alternate 4A as Alternate 5A did.

TABLE VIII

ALTERNATE 4A

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Dallas	$ 24850	$ 145000	$ 68100	$ 213100	$ 141400	$ 354500	$ 36400	$ 4000	$ 300	$ 40700
St. Louis	77341	360000	211900	571900	459800	1031700	105700	10100	600	116400
Memphis	29785	150000	81600	231600	165800	397400	40700	4800	300	45800
Atlanta	37665	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13430	65000	36800	101800	65000	166800	17100	1500	500	19100
Detroit	46100	225000	126300	351300	280300	631600	64700	8300	300	73300
	$229171	$ 1080000	$ 627900	$ 1707900	$ 1320800	$3028700	$ 310400	$ 34000	$ 2300	$346700

TABLE IX

ALTERNATE 4B

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Dallas	$ 24850	$ 145000	$ 68100	$ 213100	$ 141400	$ 354500	$ 36400	$ 4000	$ 300	$ 40700
St. Louis	77341	360000	211900	571900	459800	1031700	105700	10100	600	116400
Memphis	29785	150000	81600	231600	165800	397400	40700	4800	300	45800
Atlanta	37665	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	18915	90000	51800	141800	98200	240000	24600	2200	500	27300
Detroit	40615	200000	111300	311300	247100	558400	57200	7600	300	65100
	$229171	$ 1080000	$627900	$1707900	$1320800	$3028700	$310400	$34000	$2300	$346700

TABLE X

ALTERNATE 5A

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Detroit	$ 46090	$ 225000	$ 126300	$ 351300	$ 280300	$ 631600	$ 64700	$ 8300	$ 300	$ 73300
Memphis	29777	150000	81600	231600	165800	397400	40700	4800	300	45800
Atlanta	37658	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13431	65000	36800	101800	65000	166800	17100	1500	500	19100
St. Louis	64916	300000	177800	477800	355500	833300	85400	8500	600	94500
Portland	14607	30000	40000	70000	81400	151400	15500	2200	-	17700
Dallas	22692	130000	62200	192200	123000	315200	32400	3600	300	36300
	$229171	$1035000	$627900	$1662900	$1279500	$2942400	$301600	$ 34200	$ 2300	$338100

TABLE XI

ALTERNATE 5B

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Memphis	$ 29777	$ 150000	$ 81600	$ 231600	$ 165800	$ 397400	$ 40700	$ 4800	$ 300	$ 45800
Atlanta	37658	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13430	65000	36800	101800	65000	166800	17100	1500	500	19100
Dallas	22692	130000	62200	192200	123000	315200	32400	3600	300	36300
Portland	15920	35000	43500	78500	88300	166800	17100	2400		19500
St. Louis	63604	295000	174300	469300	348600	817900	83800	8300	600	92700
Detroit	46090	225000	126300	351300	280300	631600	64700	8300	300	73300
	$229171	$1035000	$627900	$1662900	$1279500	$2942400	$301600	$34200	$2300	$338100

Alternate 5C

Portland was next added to Alternate 4A to assume mail coverage for all states for which it could provide coverage no more than .2 days worse than any of the Alternate 4A cities. This was done because of Portland's favorable float coverage requirement compared to the cities of Alternate 4A on the assumption that further cost reduction could be obtained. As Table XII, which presents the cost analysis for Alternate 5C, shows, a total cost of $336,700 was developed. This cost is $1,400 lower than Alternates 5A and 5B which have been the lowest cost to this point.

Alternate 5D

San Francisco was added to Alternate 4A to cover all states for which it provides better mail coverage than any Alternate 4A cities. This is the same approach taken with Alternate 5A in this case, however, San Francisco is used instead of Portland. While the cost analysis of Alternate 5D, presented in Table XIII, does show a reduction compared with Alternate 4A, the reduction is almost $6,000 less than the reduction of Alternate 5A which utilized Portland. San Francisco was therefore discarded as a possible collection bank location.

Alternate 6A

Up to this point Alternate 5C which is a seven location model composed of Detroit, Memphis, Atlanta, Minneapolis, St. Louis, Portland and Dallas has been found to be the least cost alternative to Massey Ferguson's present collection system. Alternate 6A adds Boston to Alternate 5C to cover all states for which it provides better mail coverage than

TABLE XII

ALTERNATE 5C

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Detroit	$ 46090	$ 225000	$ 126300	$ 351300	$ 280300	$ 631600	$ 64700	$ 8300	$ 300	$ 73300
Memphis	29777	150000	81600	231600	165800	397400	40700	4800	300	45800
Atlanta	37658	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13430	65000	36800	101800	65000	166800	17100	1500	500	19100
St. Louis	60560	280000	165900	445900	331400	777300	79700	7900	600	88200
Portland	20229	40000	55400	95400	117400	212800	21800	3000	-	24800
Dallas	21427	125000	58700	183700	112800	296500	30400	3400	300	34100
	$229171	$1020000	$627900	$1647900	$1281200	$2929100	$300200	$34200	$2300	$336700

TABLE XIII

ALTERNATE 5D

Bank Location	Annual Cash Receipts (000)	Presently Available Interest Savings	Presently Available Addl Wire Delay	Presently Available Total	Cash in Transit-Mail Time	Total Cash in System	Company Costs Interest	Company Costs Cash Processing	Company Costs Other Bank Charges	Company Costs Total
Dallas	$ 21427	$ 125000	$ 58700	$ 183700	$ 112800	$ 296500	$ 30400	$ 3400	$ 300	$ 34100
Detroit	46090	225000	126300	351300	280300	631600	64700	8300	300	73300
Memphis	29777	150000	81600	231600	165800	397400	40700	4800	300	45800
Atlanta	37658	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13430	65000	36800	101800	65000	166800	17100	1500	500	19100
St. Louis	70213	325000	192300	517300	397400	914700	93800	9200	600	103600
San Francisco	10576	35000	29000	64000	71200	135200	13900	1700	1000	16600
	$229171	$1060000	$627900	$1687900	$1301000	$2988900	$306400	$34200	$3300	$343900

any city of 5C. This forms an eight city model which is cost analyzed in Table XIV. As can be seen, this model reduces cost an additional $200 lower than Alternate 5C.

Alternate 6B

New York was substituted for Boston as an addition to Alternate 5C to cover all states for which it provides better mail coverage than any city of 5C. This addition of New York forms an eight location model and is cost analyzed in Table XV. As can be seen by reference to Table XV the total cost of Alternate 6B exceeds the cost of 5C by $700 and 6A by $900. New York was therefore excluded from consideration in favor of Boston.

Alternate 7

Cincinnati was next added to Alternate 6A assuming coverage for all states that it provides better mail coverage for than any of Alternate 6A. The addition of Cincinnati forms a nine location model and is cost analyzed in Table XVI. Total cost of Alternate 7 is $700 higher than 6A as a result of the addition of the additional location.

This chapter has presented various alternate banking models which the company can use for cash collection. No attempt has been made to evaluate these alternative models in depth, as this will be done in Chapter VI. Before such an evaluation, however, it is important to properly position this study in light of its limitations. These limitations being the result of the unavailability of certain information and the subsequent assumptions which have been made. This will be the function of the following chapter.

TABLE XIV

ALTERNATE 6A

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Memphis	$ 29777	$ 150000	$ 81600	$ 231600	$ 165800	$ 397400	$ 40700	$ 4800	$ 300	$ 45800
Atlanta	37658	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13430	65000	36800	101800	65000	166800	17100	1500	300	19100
St. Louis	60560	280000	165900	445900	331400	777300	79700	7900	500	88200
Portland	20229	40000	55400	95400	117400	212800	21800	3000	600	24800
Dallas	21427	125000	58700	183700	112800	296500	30400	3400	---	34100
Detroit	36975	180000	101300	281300	205200	486500	50000	5800	300	56100
Boston	9115	55000	25000	80000	54900	134900	13700	2700	600	17000
	$229171	$1030000	$627900	$1657900	$1261000	$2918900	$299200	$34400	$2900	$336500

TABLE XV

ALTERNATE 6B

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Atlanta	$ 37658	$ 135000	$ 103200	$ 238200	$ 208500	$ 446700	$ 45800	$ 5300	$ 300	$ 51400
Minneapolis	13430	65000	36300	101800	65000	166800	17100	1500	300	19100
St. Louis	60560	280000	165900	445900	331400	777300	79700	7900	500	88200
Portland	20229	40000	55400	95400	117400	212800	21800	3000	600	24800
Dallas	21427	125000	58700	183700	112800	296500	30400	3400	-	34100
Detroit	36975	180000	101300	281300	205200	486500	50000	5800	300	56100
New York	13878	75000	38000	113000	106400	219400	22400	4000	600	27000
Memphis	25014	125000	68600	193600	127400	321000	32800	3600	300	36700
	$229171	$1025000	$627900	$1652900	$1274100	$2927000	$300000	$34500	$2900	$337400

TABLE XVI

ALTERNATE 7

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Memphis	$ 29777	$ 150000	$ 81600	$ 231600	$ 165800	$ 397400	$ 40700	$ 4800	$ 300	$ 45600
Atlanta	27658	135000	103200	238200	208500	446700	45800	5300	300	51400
Minneapolis	13430	65000	36800	101800	65000	166800	17100	1500	500	19100
Portland	20229	40000	55400	95400	117400	212800	21800	3000	-	24800
Dallas	21427	125000	58700	183700	112800	296500	30400	3400	300	34100
St. Louis	53293	250000	146000	396000	287500	683500	70000	7000	600	77600
Detroit	44509	220000	121900	341900	268100	610000	62500	8000	300	70800
Cincinnati	8848	45000	24300	69300	42800	112100	11600	1400	600	13600
	$229171	$1030000	$627900	$1657900	$1267900	$2925800	$299900	$34400	$2900	$337200

CHAPTER V

ANALYSIS OF STUDY

This chapter will attempt to properly evaluate the research in light of the problems encountered. Because of the lack of information or the unwillingness of involved parties to release certain information, assumptions have been made in certain areas. It is doubtful that they are of such magnitude as to affect the realism of the recommendations put forth in Chapter VI, but they must be discussed for the sake of accuracy.

Bank Float Factors

Bank float, as can be seen from Appendix C, can range from zero to three days, dependent upon the location of both the depository bank and the customer's disbursements (checking) account. Bank float is further complicated by the fact that different banks compute average float along a broad spectrum ranging from 100% precie to 100% estimate.

To accurately measure bank float under different alternatives would require (a) a rather extensive random sample of the Company's cash receipts showing the customer bank routing symbol, which indicates the location of the bank and its clearing procedures through the Federal Reserve system, (b) detailed knowledge of the check clearing procedures for banks chosen in the study, (c) assignment of probabilities as to the time of day checks would clear the processing phase at the depository bank, and (d) rather sophisticated computer techniques to handle and equate all

of the variables. This is beyond the scope of the project.

The method chosen, however, of basing float factors for the present system on last year's experience and of modifying this experience to estimate float for both the new banks tested as alternative depositories and for different areas of coverage for the present banks appeared the most feasible approach; and, although the margin of error is probably greater in this area than in any other in the model design, it is not felt that this error is sufficient to undermine the validity of the overall results. For this reason, however, the study is somewhat conservative in estimating this factor in favor of the present system.

Lock Box Charges

As mentioned previously, an overall average cost was used for all banks in the study since it was difficult to obtain estimated lock box costs for the individual banks considered without their study of the company's actual receipts and review of its specific requirements. If lock box banking were considered for adoption, a further study is recommended which would include a review with each bank, in the most favorable alternative, of the company's requirements, obtaining their actual charges for this service and retabulating the company's cost for each alternative.

Collection Patterns

Present RSO's do not follow state lines (see Appendix A, Map 2) and as many as four RSO's may receive receipts from one state. In the

alternatives tested, no attempt was made to keep RSO areas intact. Collection, rather, was determined on the basis of mail service. In the same manner, possible locations for regional collection points were not limited to RSO or other company locations.

It is felt that the company can adapt to central cash processing with a minimum of inconvenience, due to the recent centralization of RSO accounting, and that no delay would result in the application of the cash to customer accounts. A great deal of work has not been spent on this phase of the problem, however, and if this is to be seriously considered, additional work would have to be done in this area to ensure that there is no interruption in the billing process, that credit personnel in the field are kept sufficiently informed as to customer remittances, and details are properly worked out for necessary accounting changes.

Assumptions Made

Collections were tested against the model on an annual basis and seasonal fluctuations were ignored, although the analysis by month of both the wholesale and retail receipts indicated that marked differences do exist due to seasonal patterns. This can be seen by referring to Appendix D which contains an analysis of cash receipts by month for the company's fiscal 1969 year. It was felt that the introduction of this variable into the model would materially complicate the calculations yet have little effect on the comparable basis of the different alternatives.

Actual 1969 cash receipts were used in the model, since it seems that this represented the best basis for comparison with the present banking structure since many of the important variables, such as bank

float, are already known. Changes in the company's business resulting in changed collection patterns would necessitate the updating of this study and may result in different alternative structures.

The fit of the mail times used in the study to the company's business has already been discussed in the previous chapter. It must, also, be pointed out that the mail times are the result of a one month test (October 1969) of mail delivery service and that its long range validity, as well as changes subsequent to the test due to (a) mail volume, (b) air and surface mail routes as well as changes in the use of each, (c) new or improved postal facilities, (d) availability and experience of labor in each city included in the study, and (e) the recent postal reorganization, all affect the relative service of each location. Mail service of the different cities should, as a result, be reviewed periodically.

CHAPTER VI

FINDINGS AND RECOMMENDATIONS

Research Findings

Cash Processing

Based on the test made of the comparative advantage of lock box banking and company cash processing, it was found that the use of lock box facilities for all banks, based on the Alternate 2 bank structure, would free up approximately $152,000 of cash over the present system. In addition, despite the higher per item cost of lock box remittances a net savings of $10,300 results. This improvement was shown, even though only 40% of the total cash collection of Alternate 2 banks are collected through RSO banks, the lowest percentage under any alternative.

Since the tests clearly indicated the advantage of lock box remittance over company cash processing, all other alternatives were tested using only lock box collection.

Bank Structure

The results of the alternate systems tested are summarized in Table XVII. As can be seen, all alternatives offer improvements over the present bank arrangement, both as to the amount of cash freed up from the liquidation cycle and as to the total cost of the structure.

Alternate 6A, which had the lowest cost of those tested, provides $652,000 more cash and results in an annual cost reduction of $60,200 compared with the present banking model.

An analysis of the factors contributing to the savings of successive alternatives is presented in Table XVIII. Even though the optimum alternative includes a complement of eight banks, the additional return contributed by the individual banks varied. As demonstrated below, the total number of regional collection banks could be reduced to five, with a small increase in the overall costs.

	Total cash in system	Company Costs
Optimum solution - Alternate 6A	$2,918,900	$336,500
Less lowest contributing bank		
Boston	10,200	200
Memphis[1]	22,100	1,700
Minneapolis	38,500	3,200
5 Bank Alternative	2,989,700	341,600

The banks included in the above alternative include Detroit, Dallas, Atlanta, St. Louis and Portland.

Alternative bank locations, representing combinations of the above eight banks, must all be considered as falling within the acceptance limits of the study. Acceptable bank combinations are as follows:

5 Banks. Detroit, Dallas, Atlanta, St. Louis and Portland

6 Banks. Minneapolis added

---

[1] Memphis contribution represents Alternate 3B minus 3C.

TABLE XVII

RECAP OF ALTERNATIVES TESTED

Alternate	No. of Banks	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Present System	14	$ 1500000	$633600	$2133600	$1437300	$3570900	$366000	$ 30700	$ -	$396700
Present, Modified	14	1270000	633600	1903600	1437300	3340900	342400	30700	7900	381000
Alternate 1	7	1135000	532300	1667300	1326200	2993500	306800	34200	2600	343600
2	4	1120000	627900	1747900	1399000	3146900	322600	33400	1500	357500
3A	5	1080000	627900	1707800	1364300	3072100	314900	33700	1800	350400
3B	5	1075000	627900	1702900	1364300	3067200	314400	33700	1800	349900
3C	4	1070000	627900	1697900	1391400	3089300	316700	33400	1500	351600
4A	6	1080000	627900	1707900	1320800	3028700	310400	34000	2300	346700
4B	6	1080000	627900	1707900	1320800	3028700	310400	34000	2300	346700
5A	7	1035000	627900	1662900	1279500	2942400	301600	34200	2300	338100
5B	7	1035000	627900	1662900	1279500	2942400	301600	34200	2300	338100
5C	7	1020000	627900	1647900	1281200	2929100	300200	34200	2300	336700
5D	7	1060000	627900	1687900	1301000	2988900	306400	34200	3300	343900
6A	8	1030000	627900	1657900	1261000	2918900	299200	34400	2900	336500
6B	8	1025000	627900	1652900	1274100	2927000	300000	34500	2900	337400
7	8	1030000	627900	1657900	1267900	2925800	299900	34400	2900	337200

TABLE XVIII

RECAP OF SAVINGS OF ALTERNATIVES OVER PRESENT SYSTEM

	Number of Banks	Total Cash in System	Company Costs		
			Interest	Other	Total
Present System	14	$ 3,570,900	$ 366,000	$ 30,700	$ 396,700
Pay Wire Charges Direct		(130,000)	(23,600)	7,900	(15,700)[1]
Present System, Modified	14	3,340,900	342,400	38,600	381,000
Adopt 4 regional banks	(10)	(194,000)	(19,800)	(3,700)	(23,500)
Alternate 2	4	3,146,900	322,600	34,900	357,500
Add Atlanta	1	(79,700)	(8,200)	600	(7,600)
Alternate 3B	5	3,067,200	314,400	35,500	349,900
Add Minneapolis	1	(38,500)	(4,000)	800	(3,200)
Alternate 4A	6	3,028,700	310,400	36,300	346,700
Add Portland	1	(99,600)	(10,200)	200	(10,000)
Alternate 5C	7	2,929,100	300,200	36,500	336,700
Add Boston	1	(10,200)	(1,000)	800	(200)
Alternate 6A	8	2,918,900	299,200	37,300	336,500

[1]Parentheses indicate a reduction, by the amount enclosed, compared with the preceding alternate.

7 Banks. Memphis added

8 Banks. Boston added

Recommendations

This study has indicated that savings can be realized through improvements in the present regional collection bank system in at least three ways:

Payments made to banks for special services. Money left on deposit to cover bank expenses results in a net cost to the company of between six and seven per cent, based on the difference between current interest cost and average bank earnings rates. It would be to the company's advantage to pay as many bank charges direct as is mutually agreeable with the individual banks and to maintain predetermined balances at a minimum level.

Use of lock box bank facilities. The reduction in the liquidation cycle, through earlier deposit of funds and reduction of bank float, more than offsets the bank processing costs involved. This is particularly true if the bank is located in a Federal Reserve city and if frequent pickups of mail are made including nights and weekends. Application of lock boxes in this study was limited to the use of bank services required to replace the Company's present cash processing work. In addition, however, a number of banks offer more sophisticated services, including computer data transmission to tie into company systems for accounts receivable and cash receipts. These services and their cost warrant further investigation.

Reduction in the number of regional collection banks. The use of banks at each RSO location and the maintenance of RSO boundaries for the collection of cash was to a large degree both necessary when the accountingrecords and receivable detail were also kept at that level. With the centralization of RSO accounting in Des Moines, this segregation is no longer a necessary criterion in establishing bank locations. The test results clearly indicate that the number of banks can be substantially reduced through the selection of bank locations and boundaries on the basis of the criteria established in this study: mail times, bank float and bank charges.

The results of the study indicate that the continuing benefits to be derived through the three improvements mentioned above are such as to justify their implementation. The selection of any of the four acceptable bank combinations would allow for a cash collection model of reduced cost compared with the present model.

A regional system including five banks at Detroit, Dallas, Atlanta, St. Louis and Portland eliminates all but one RSO bank (Portland), utilizes one major line bank (Detroit) and two of the regional line banks (Dallas and Atlanta). The use of St. Louis, which represents the only new bank added, is essential to the system due to its excellent mail service from the important midwestern states, offering better service than Chicago, Kansas City, and Des Moines (all present bank locations). Minneapolis was included as a possible sixth bank due to its coverage in the upper corn belt states. It is a regional line bank.

The inclusion of Memphis as a seventh bank location is due principally to its coverage of Tennessee. It would add a second RSO bank to the system.

If included, Boston would add the only other new bank beside St. Louis to the system. It offers somewhat better coverage to the northest states, including New York, than other banks in the Pennsylvania, New York area. Even with Boston, mail service in the east is relatively poor and coverage from Detroit of the eastern states is not much worse. Rather than adding Boston as a new bank Detroit may therefore be preferable.

Excluding the Boston, Memphis considerations, the five or six bank configuration clearly offers distinct advantage to the Company. Eight RSO banks and two regional line banks could be eliminated, predetermined bank balances could be reduced by over $600,000 and annual savings of over $50,000 obtained. The final selection of bank locations depend, of course, on a number of factors: projected growth, location and need of present banks, services offered by the banks and so forth. These also must be considered in the decision.

Accounting System Considerations

Certain limitations in the study have previously been noted which require some degree of study before any changes are made. One is the review of the accounting procedures in connection with cash processing under the present system and necessary changes due to conversion to central cash handling. It is not anticipated that any major difficulties exist, but work needs to be done to ensure a smooth transition.

Bank Charges

Due to the substantial differences in bank charges for services, particularly under lock box arrangements, competitive "quotes" may be warranted in lock box cities, particularly where new banking connections are necessary. Monthly bank statement analysis prepared by the banks should, also, be reviewed by the Treasury Department for (a) level of float, and (b) unusually high charges.

Retail Store Bank Accounts

Bank accounts maintained at 45 Company operated retail dealerships were not included in this study due to their relatively small size. The retail stores deposit remittances from their customers in local bank accounts and transfer funds by bank transfer checks to concentration banks when the bank balance exceeds a certain level. Local expenses incurred are disbursed through their local bank account.

Retail store remittances could be mailed directly to lock box banks and local bank accounts eliminated. Disbursements made by retail stores could be made by a draft made payable on a Des Moines bank, as is currently done for RSO expenses paid locally.

Cash Management Information System

The area of cash receipts is but a small part of total cash management. Funds are borrowed and repaid, transferred between banks and invested daily, based on information available as to the current day's cash position and requirements and forecasts of short, intermediate and long term cash transactions. These duties represent most of the routine

day to day work of the Banking Manager.

Improvements generated in control, in the receipt of more timely and accurate information and in forecasting techniques, all provide invaluable tools for effective decision making. Much of the day to day treasury work is of a quantifiable nature and lends itself well to mechanized handling. A daily program may be utilized, for example, to generate cash requirements, recommended cash transfers and valuable forecasting data, based on the submission of the daily variable information (cash receipts and disbursements). Further study in this area could result in very worthwhile savings.

CHAPTER VII

SUMMARY

The intent of this project has been the formulation of a model to determine the optimum number and location of banks and method of processing cash receipts that would minimize the overall cash collection cost to Massey Ferguson. The criteria of (a) mail times, (b) bank float, and (c) bank charges were identified as central to the construction of the model and the testing of alternative bank configurations to reduce the funds tied up in the liquidation cycle and at banks.

The research approach was to a large degree descriptive, in that emphasis was placed on obtaining sufficient data about factors affecting cash receipts, bank charges and procedures and other factors necessary to properly analyze the present system and obtain information necessary for the testing of alternatives against the model.

Data gathered for the construction of the model included the following items:

1. The number and amount of cash receipts by state and by present regional collection banks.
2. The average bank float experienced by the Company at each bank during the past year in comparison to average daily receipts.
3. Bank charges and earnings rates used in computing the Company's monthly bank account analysis. This information was also obtained for all banks considered as alternatives.

4. Calculation of Company costs involved in cash processing.

5. Calculation of interest costs.

6. Determination of mail times from all states to principal cities.

7. Information on lock box procedures, costs and advantages.

Mail times used were based on a bank study. Information on lock boxes, methods of float calculation and missing bank charges was obtained through phone conversations with various bankers and from bank reports and studies. The other information was obtained principally from Company records.

In the model design, the total cost of the system was determined to consist of the sum of (1) interest cost of cash in transit, bank predetermined balances and additional bank funds due to delay in making wire transfers, (2) cash processing costs and (3) any direct bank charges not included in (2) above.

Alternatives were chosen and costs were determined for comparison against the present system. All of the alternatives tested were found to be better than the present system. The best alternative, which utilized eight locations, resulted in a reduction of total cash in the system of $652,000 and an annual expense savings to the Company of $60,000, in comparison to the present system. Three other banking configurations with as few as five banks were found to provide savings of $50,000 or more.

An analysis of the results indicate that savings can be realized from the present regional cash collection system by (1) paying banks for

special services, such as wire transfer costs and lock box services, rather than carrying sufficient bank balances to compensate them for these services, (2) utilizing lock box facilities in place of Company cash collection, and (3) relocating collection banks in Federal Reserve cities based on minimum bank charges, bank float and mail time.

It is felt that the results of the study offer sufficient evidence that the above changes, if made, would make more cash available, result in lower cost to the Company, reduce the number of bank accounts required and that the difficulties encountered and expenses incurred in the period of transition would not pose a significant problem. It is, therefore, recommended that a study be undertaken of necessary internal systems changes in order that an evaluation of these recommendations may be made as soon as possible.

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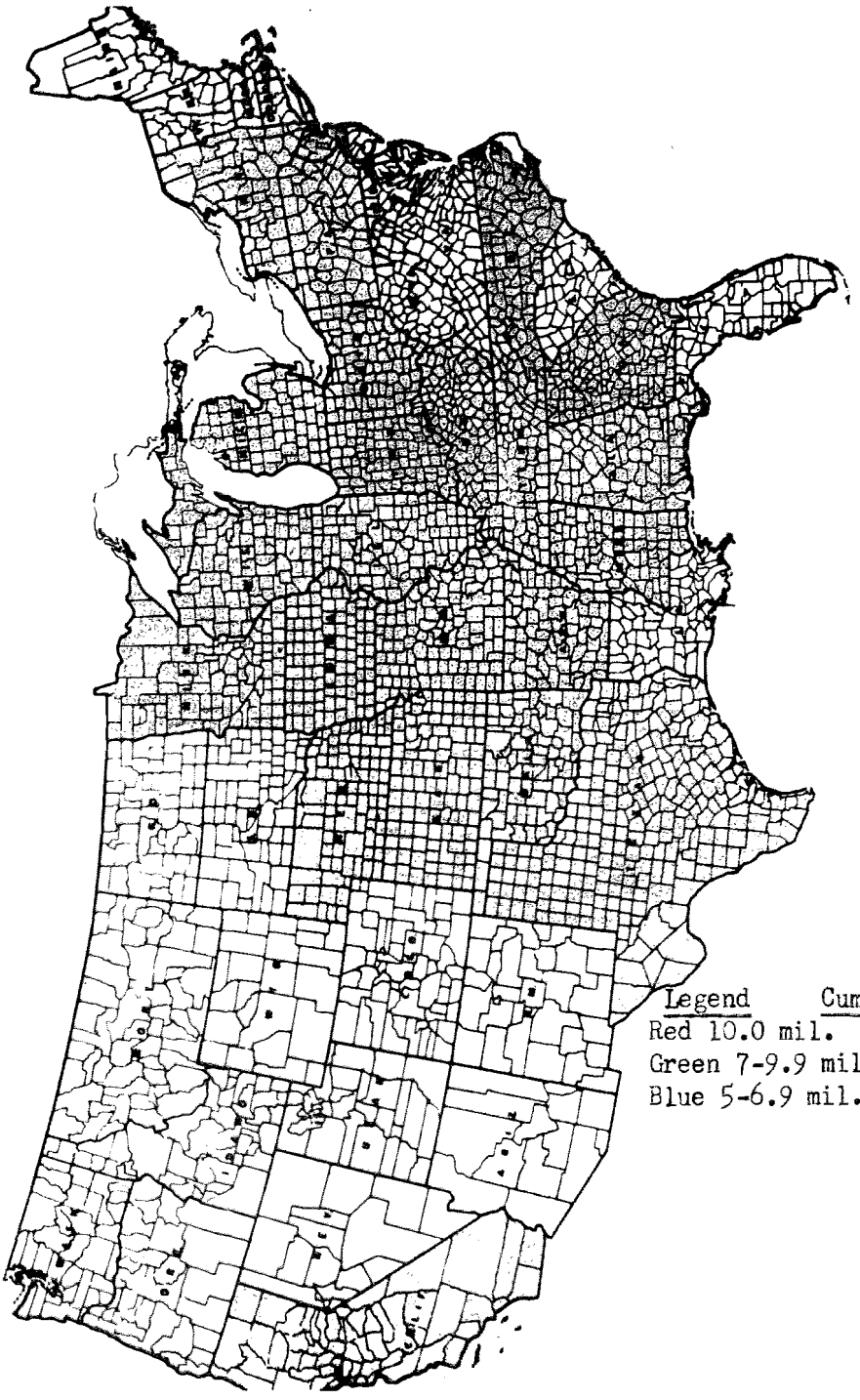
APPENDIXES

APPENDIX A

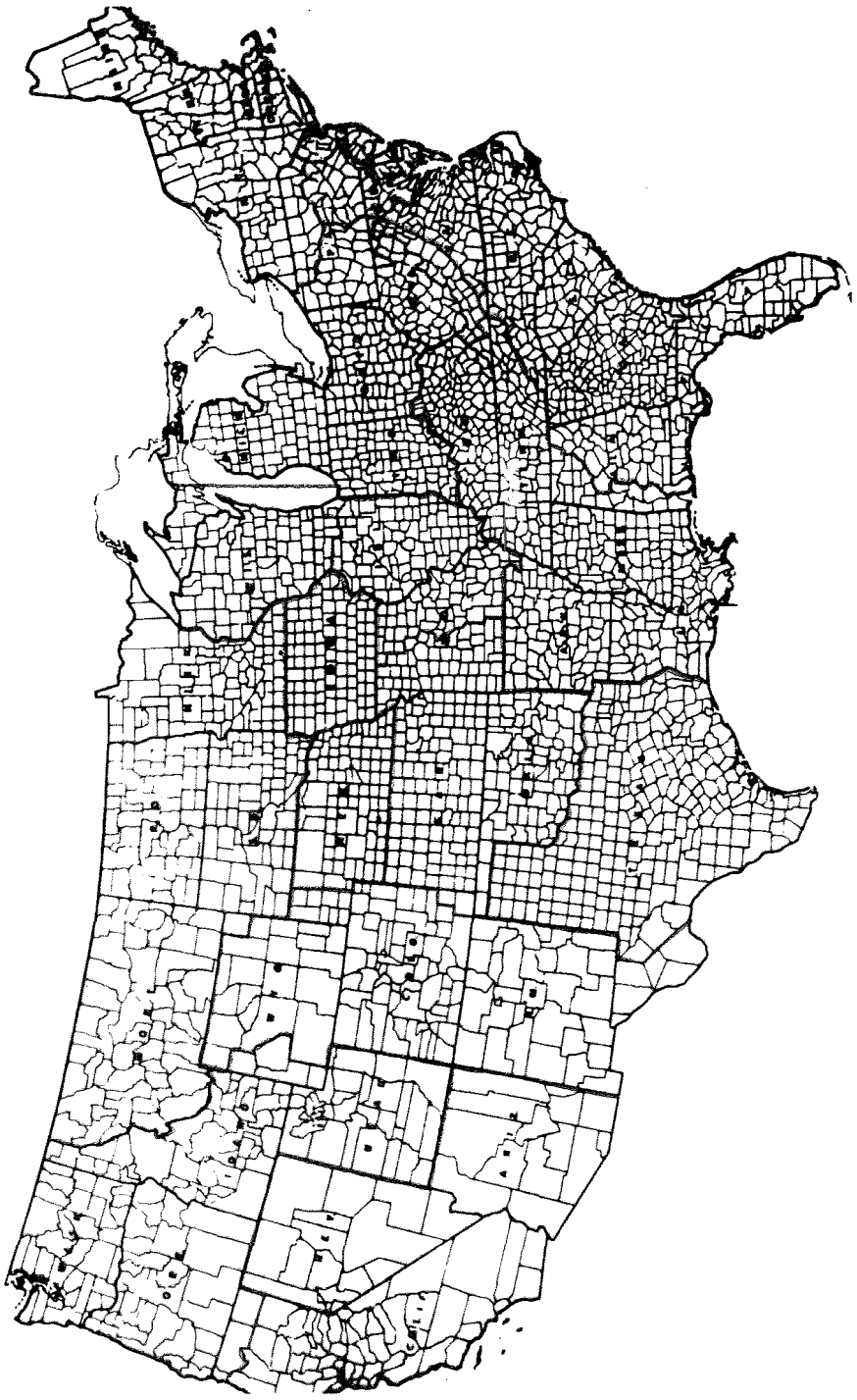
Map 1



Legend	Cumulative %
Red 10.0 mil.	29%
Green 7-9.9 mil.	51%
Blue 5-6.9 mil.	79%

APPENDIX A

Map 2



Based on National Bank
of Detroit 1968 Mail Study

Mail Time to Principal Cities

	Alternate 2				Alternate 3	Alternate 4	Alternate 5		Alternate 6	Alternate 7	Alternate 6a
	Detroit	Dallas	Memphis	St. Louis	Atlanta	Minneapolis	Portland or San Francisco		New York	Cincinnati	Boston
abama	2.2	1.9	1.3	2.1	1.3						
izona	2.0	1.6	2.0	1.8		1.9	2.0	1.7			
kansas	2.0	1.2	1.2	1.4	2.1						
lifornia	2.3	2.2	2.5	2.2			1.7	1.5			
loredo	2.1	1.6	1.9	1.4		1.9	1.5	1.9			
nnecticut	2.1	2.1	2.2	2.3	2.2				1.7		1.2
laware	1.6	2.1	2.4	1.4	1.9				1.7	2.1	1.9
orida	2.1	2.0	2.0	2.1	1.3						
orgia	2.0	2.1	1.3	2.1	1.2						
aho	2.1	2.2	2.3	2.2		2.4	1.2	2.2			
linois	2.0	1.9	2.1	1.3						2.5	
diana	1.2	2.2	2.0	1.6	2.1	2.1			2.1	1.6	2.1
wa	2.1	2.2	2.1	1.4		1.7				2.1	
nsas	1.9	1.2	1.9	1.2		1.9	2.0	2.0			
ntucky	1.5	2.1	2.0	1.5	1.7	2.0			2.1	1.2	2.1
uisiana	2.1	1.2	1.2	1.6	1.7						
ine	2.0	2.2	2.3	2.1	2.2				1.8		1.2
ryland	2.0	1.9	1.4	2.1	2.1				2.1	2.0	1.6
ssachusetts	1.8	2.1	2.2	2.1	2.1				1.7		1.2
chigan	1.2	2.5	2.2	2.1	2.5	2.1			2.1	1.9	2.2
nnesota	1.9	2.0	2.2	1.9		1.2	2.2	1.9		1.9	
ssissipoi	1.9	1.2	1.2	1.2	1.2						
ssouri	2.0	2.0	1.4	1.3						2.1	
ntana	2.0	2.0	2.2	1.6		1.3	1.2	1.6			
braska	2.1	1.8	2.1	1.5		1.5	2.2	2.1			
vada	2.1	1.7	2.5	1.6		2.3	1.9	1.4			
w Hampshire	2.0	2.0	2.1	2.1	2.0				1.6		1.2
w Jersey	2.1	2.1	2.2	2.1	2.1				2.0		1.9
w Mexico	2.1	1.9	2.2	1.9		2.1	2.6	1.9			
w York	2.1	2.2	2.2	2.1	2.2				2.0	2.1	1.6
orth Carolina	2.0	2.1	1.9	2.1	1.6				2.2	2.1	2.0
orth Dakota	2.0	2.0	2.4	2.0		1.2	2.0	2.1			
hio	1.2	2.4	2.2	2.0	2.1	2.2			2.3	1.2	2.1
klahoma	2.0	1.2	1.9	1.3	2.1		1.7	2.1			
regon	2.1	2.3	2.3	2.1			1.2	1.5			
ennsylvania	2.0	2.2	2.3	2.1	2.2				2.1	2.1	2.1
outh Carolina	2.0	2.2	2.1	2.1	1.6				2.2	2.2	2.0
outh Dakota	2.0	2.0	2.2	2.0		1.2	2.0	2.3			
ennessee	2.1	1.9	1.3	1.9	1.8						
exas	2.6	1.3	2.1	2.1	2.2		2.7	2.1			
tah	2.1	2.0	2.1	1.2		1.5	1.2	1.4			
ermont	1.9	2.2	2.1	2.0	2.1				1.7		1.2
rginia	2.0	2.2	2.0	2.1	2.2				1.9	2.2	2.0
shington	2.2	2.1	2.3	2.1			1.2	2.1			
est Virginia	1.9	2.1	2.2	2.1	2.1				2.2	1.2	2.3
sconsin	1.5	2.2	2.2	1.9		1.5				2.1	
yoming	2.1	2.0	2.4	2.2		2.0	2.1	1.9			

APPENDIX C

BASIS FOR CALCULATING BANK FLOAT

A. The total deposit is analyzed as to the "payable location of check".

Assume deposit made Wednesday.

(Wednesday) 1. Same day credit (no float)

a. Cash
b. Checks drawn on bank to which deposit was made.

(Thursday) 2. 2nd day Credit (1 day float)

a. Checks drawn on banks in same city (clearing house items).
b. This does not apply to checks deposited on a Friday since they would not "clear" until Monday (3 days later).

(Friday) 3. 3rd day Credit (2 day float)

a. Checks written on banks in same state or area which honor "cash letters" from the bank receiving deposit.
b. This assumes a one day mailing time - cash letter mailed Wednesday, received by payable bank Thursday, honored and returned by Friday.

(Monday) 4. 4th day Credit (3 day float)

a. Checks written on same area banks that do not accept "cash letters" from the receiving bank.
b. These items must be sent to the receiving bank's Federal Reserve bank for processing.

5. As described above, the day of the week the deposit is made affects the availability.

a. A three-day float check deposited on Monday becomes available funds on Thursday, three days after the depositor receives it.
b. A three-day-float check deposited on Wednesday becomes available funds on Monday, five days after the depositor receives it.

A check written on a bank described in 4.a. will clear no faster than a check written on a bank 2,000 miles away because each check will clear the Federal Reserve bank in their district as a 3 day float item.

APPENDIX D

ANALYSIS OF CASH RECEIPTS BY MONTH FOR THE YEAR ENDED 10/31/69

Wholesale	# of Payments	Amount of Cash Receipts	% of C/R To Total Year	Ave. $Amt. of C/R*
Nov. 68	3,310	$ 5,666,543.66	4.0	$ 1,712
Dec. 68	2,776	4,322,426.91	3.1	1,557
Jan. 69	3,581	4,762,432.31	3.4	1,330
Feb. 69	3,141	5,632,357.28	4.0	1,793
Mar. 69	4,263	9,263,758.18	6.5	2,173
Apr. 69	4,807	12,455,100.28	8.8	2,591
May 69	5,759	12,807,797.60	9.0	2,224
June 69	7,255	18,043,025.39	12.7	2,487
July 69	5,150	14,240,749.63	10.0	2,765
Aug. 69	4,542	11,381,884.93	8.0	2,506
Sept. 69	5,730	14,879,926.43	10.5	2,597
Oct. 69	7,202	28,369,261.95	20.0	3,939
	57,516	$141,825,264.55	100.0%	$2,466
Retail				
Nov. 68	10,498	$ 6,023,664.47	6.9	$ 574
Dec. 68	19,146	15,881,471.06	18.0	829
Jan. 69	12,293	8,071,161.31	9.2	657
Feb. 69	11,503	5,206,196.90	5.9	453
Mar. 69	14,860	12,979,105.50	14.8	873
Apr. 69	11,995	6,622,215.81	7.5	552
May 69	9,269	3,004,361.57	3.4	324
June 69	12,606	4,552,428.56	5.2	361
July 69	12,986	6,203,635.70	7.1	478
Aug. 69	11,189	5,231,635.70	6.0	468
Sept. 69	16,084	6,474,819.08	7.4	403
Oct. 69	14,950	7,542,470.57	8.6	505
	157,379	$ 87,791,179.24	100.0%	$ 558

*Based on sample

APPENDIX E

PRESENT SYSTEM

Bank Location	Annaul Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Dallas	$ 15771	$120000	$ 43200	$ 163200	$ 82100	$ 245300	$ 25100	$ 2200		$27300
Kansas City	16401	105000	44900	149900	92200	242100	24800	2100		26900
Atlanta	29234	130000	80100	210100	167600	377700	38700	3000		41700
Minneapolis	16250	105000	44500	149500	80800	230300	23600	1800		25400
Baltimore	12411	85000	34000	119000	78500	197500	20300	2600		32900
Columbus	26322	165000	72100	237100	174000	411900	42100	2700		44800
Denver	7138	50000	19600	69600	37300	106900	11000	1700		12700
Memphis	38670	210000	106000	316000	217300	533300	54700	3200		57900
Portland	7601	15000	-	15000	37900	52900	5400	1700		7100
Rockford	7889	85000	-	85000	43700	128700	13200	1600		14800
Springfield	15886	180000	43500	223500	83500	307000	31500	2300		33800
Stockton	6370	60000	-	60000	39700	99700	10200	1500		11700
Syracuse	8573	95000	32500	127500	57400	184900	18900	2200		21100
Add 15 add'l float*					138600	138600	14200			14200
	$229171	$1500000	$ 633600	$ 2133600	$1437300	$3570900	$ 366000	$ 30700		- $396700

*Cash received after morning mail, deposited on following day.

APPENDIX E (continued)

The cost summary contained on page one of this Appendix is the result of applying the various cost information gathered from the respective banks to the universal formula developed in Chapter 3. The cost information and calculations for the Present System are explained below in support of the summary, and as an example of the process involved in similar summaries presented as alternates to this system in Chapter 4.

Presented below are data on each of the banks in the present system broken down by the states which they service. The data develop average float which is vital to cost calculation.

Bank Location	State	Total Cash Receipts	Average Business Day's Receipts	Mail Time	Average Float
Atlanta	Alabama	$ 3024572	$ 12196	1.3	$ 15855
	Florida	3918938	15802	1.3	20543
	Georgia	8096558	32647	1.2	39176
	N. Carolina	9724198	39210	1.6	62736
	S. Carolina	4261898	17185	1.6	27496
	Tennessee	8108	33	1.8	59
	Virginia	199728	805	2.2	1771
		$29234000	$111878	1.4	$167636
Baltimore	Delaware	997307	4021	1.5	6032
	Maryland	2386878	9625	1.2	11550
	New Jersey	860151	3468	1.7	5896
	Pennsylvania	3653200	14731	2.0	29462
	Virginia	4337527	17490	1.4	24486
	W. Virginia	158125	638	1.5	957
	New York	17812	72	2.1	151
		$ 12411000	$50044	1.6	$78534
Columbus	Illinois	170847	689	2.1	1447
	Indiana	8518125	34347	1.7	58390
	Kentucky	80757	326	1.9	619
	Michigan	5670012	22863	1.7	38867
	Ohio	9312615	37551	1.5	56327

APPENDIX E (continued)

Bank Location	State	Total Cash Receipts	Average Business Day's Receipts	Mail Time	Average Float
Columbus	Pennsylvania	$ 1128861	$ 4552	2.1	$ 9559
	Virginia	8973	36	2.1	76
	W. Virginia	1423197	5739	1.5	8609
	Nebraska	8973	36	2.1	76
		$26322000	$ 106138	1.6	$ 173970
Dallas	Arizona	$ 5647	$ 23	1.6	$ 37
	Arkansas	214586	865	1.2	1038
	Colorado	5647	23	1.6	37
	Kansas	22588	91	1.2	109
	Louisiana	16941	68	1.2	82
	Mississippi	5647	23	1.2	28
	New Mexico	28235	114	1.9	217
	Oklahoma	1312097	5291	1.2	6349
	Texas	14159612	57095	1.3	74224
		$15771000	$ 63593	1.3	$ 82121
Denver	Arizona	$ 43812	$ 177	1.6	$ 283
	Arkansas	4868	20	2.1	42
	California	2434	10	2.2	22
	Colorado	2994050	12073	1.2	14488
	Idaho	4868	20	2.2	44
	Iowa	2434	10	2.0	20
	Kansas	434460	1752	1.3	2278
	Missouri	7302	29	1.8	52
	Montana	4868	20	1.2	24
	Nebraska	765000	3085	1.2	3702
	New Mexico	574786	2318	1.6	3709
	Oklahoma	26774	108	1.9	205
	S. Dakota	7302	29	2.0	58
	Texas	282922	1141	2.1	2396
	Utah	1039550	4192	1.2	5030
	Wyoming	942570	3801	1.3	4941
		$ 7138000	$ 28782	1.3	$ 37294
Des Moines	Illinois	$ 12012	$ 48	1.6	77
	Iowa	14521488	58554	1.2	70265
	Kansas	96096	387	1.4	542
	Minnesota	48048	194	1.7	330
	Missouri	817116	3295	1.3	4283
	Nebraska	5112192	20614	1.5	30921
	N. Dakota	12012	48	2.0	96
	S. Dakota	36036	145	1.9	276
		$20655000	$ 83286	1.3	$ 106790

APPENDIX E (continued)

Bank Location	State	Total Cash Receipts	Average Business Day's Receipts	Mail Time	Average Float
Kansas City	Arkansas	$ 719418	$ 2901	1.5	$ 4352
	Colorado	36735	148	1.3	192
	Illinois	36735	148	2.0	296
	Iowa	44082	178	1.7	303
	Kansas	6054564	24414	1.2	29297
	Massachusetts	7347	30	2.2	66
	Minnesota	7347	30	2.1	63
	Missouri	5462721	22027	1.7	37446
	Montana	14694	59	1.7	100
	Nebraska	66123	267	1.5	401
	N. Dakota	29388	119	2.0	238
	Oklahoma	3804294	15340	1.2	18408
	S. Dakota	58776	237	2.0	474
	Texas	58776	237	2.1	498
		$16401000	$66133	1.4	$ 92134
Memphis	Arkansas	$ 7058510	$ 28462	1.2	$ 34154
	Louisiana	3625930	14621	1.2	17545
	Missouri	889410	3586	1.4	5020
	Oklahoma	211484	853	1.9	1621
	Alabama	2135900	8613	1.3	11197
	Georgia	15106	61	1.3	79
	Kentucky	7070520	28510	2.0	57020
	Mississippi	6452494	26018	1.2	31222
	N. Carolina	15106	61	1.9	116
	Tennessee	10978626	44269	1.3	57550
	Virginia	216914	875	2.0	1750
		$38670000	$ 155928	1.4	$ 217274
Portland	California	$ 5638	$ 23	1.7	$ 39
	Connecticut	2819	11	2.1	23
	Idaho	3187310	12852	1.2	15422
	Nevada	8457	34	1.9	65
	Oregon	1723052	6948	1.2	8338
	Utah	195766	789	1.2	947
	Washington	2184235	8807	1.2	10568
	Wyoming	288941	1165	2.1	2447
	Alaska	4782	20	3.0	60
		$ 7601000	$ 30649	1.2	$ 37909
Rockford	Illinois	$ 2896880	$ 11681	1.3	$ 15185
	Indiana	117564	474	1.8	853
	Iowa	10176	41	1.6	66
	Michigan	61082	246	1.8	443
	Wisconsin	4803298	19368	1.4	27115
		$ 7889000	$ 31810	1.4	$ 43662

APPENDIX E (continued)

Bank Location	State	Total Cash Receipts	Average Business Day's Receipts	Mail Time	Average Float
Springfield	Illinois	$ 11831075	$ 47706	1.3	$ 62018
St. Louis	Indiana	92268	372	1.6	595
	Kentucky	115335	465	1.5	698
	Mississippi	7689	31	1.2	37
	Missouri	3839633	15482	1.3	20127
		$15886000	$ 64056	1.3	$83475
Stockton	Arizona	883224	$ 3561	1.7	$ 6054
San Fran-	California	5317624	21442	1.5	32163
cisco	Nevada	70848	286	1.4	400
	N. Mexico	5424	22	1.9	42
	Oklahoma	19888	80	2.1	168
	Hawaii	72992	294	3.0	882
		$ 6370000	$ 25684	1.5	$39709
Syracuse	Connecticut	$ 391809	$ 1580	1.7	$ 2686
	Maine	531294	2142	1.8	3856
	Massachusetts	701364	2828	1.7	4804
	New Hampshire	286848	1157	1.6	1851
	N. Mexico	2317	9	2.1	19
	New York	5142873	20737	1.6	33179
	Pennsylvania	359371	1449	2.1	3043
	Vermont	115712	4666	1.7	7932
		$ 8573000	$ 34568	1.7	$57374
Minneapolis	Colorado	$ 7037	$ 28	1.9	$ 53
	Iowa	70370	284	1.7	483
	Kansas	35185	142	1.9	270
	Minnesota	6685787	26959	1.2	32351
	Montana	2162777	8721	1.3	11337
	Nebraska	7037	28	1.5	42
	N. Dakota	3754259	15138	1.2	18166
	S. Dakota	2800001	11290	1.2	13548
	Texas	14074	57	2.7	154
	Wisconsin	680973	2746	1.5	4119
	Wyoming	32500	131	2.0	262
		$16250000	$ 65524	1.2	$80785
			$ 924073	1.4	$1298667

APPENDIX E (continued)

Next a development of processing cost is made based upon the number of cash receipts per banking location as developed by this project and the Company processing costs as developed by the previously mentioned Company study by Moore and Johnson.

Bank Location	Number of Cash Receipts	M. F. Processing Cost	Total Variable Cost	Fixed Cost	Total Cost
Dallas	16,088	$ .065	$ 1046	$ 1200	$ 2246
Kansas City	14,043	.065	912	1200	2112
Atlanta	27,070	.065	1760	1200	2960
Minneapolis	9,710	.065	631	1200	1831
Des Moines	13,367	.065	868	1200	2068
Baltimore	21,980	.065	1429	1200	2629
Columbus	23,116	.065	1503	1200	2703
Denver	6,966	.065	452	1200	1652
Memphis	29,853	.065	1941	1200	3141
Portland	8,270	.065	537	1200	1737
Rockford	6,726	.065	437	1200	1637
Springfield	17,104	.065	1112	1200	2312
Stockton	4,433	.065	288	1200	1488
Syracuse	15,385	.065	1001	1200	2201
	214,111	$ .065	$ 13917	$16,800	$30,717

APPENDIX E (continued)

Finally, the predetermined bank balance has been formulated in Chapter 3 as being:

$$P \geq \frac{a\,(f-y) + z\,(n) + t + o}{e}$$

a = Average day's receipts (total receipts ÷ 365)

f = Bank float factor

y = Number of days delay in wire transfer

z = Bank charge per deposit item

n = Number of cash receipts

t = Wire transfer costs

o = Other bank charges

e = Bank effective earning rate

APPENDIX E (continued)

Dallas

$$P = 43,200\ (3.3-1) + \frac{.03\ (16,088) + 275 + 130}{.045275}$$

$$P = 99,360 + \frac{482.64 + 405}{.045375}$$

$$P = 99,360 + 887.64\ /\ .045375$$

$$P = 99,360 + 19,562$$

$$P = 118,922 \quad (120,000 \text{ rounded})$$

Kansas City

$$P = 44,900\ (2.7-1) + \frac{.03\ (14,043) + 600 + 70}{.045375}$$

$$P = 76,330 + 1091.29\ /\ .045375$$

$$P = 76,330 + 24,050$$

$$P = 100,380 \quad (105,000 \text{ rounded})$$

Atlanta

$$P = 80,100\ (2.4-1) + (.02(27,070) + 375 + 200)/\ .07$$

$$P = 112,140 + 1116.40/\ .07$$

$$P = 112,140 + 15,949$$

$$P = 128,089 \quad (130,000 \text{ rounded})$$

Minneapolis

$$P = 44,500\ (2.8-1) + (.02(9710) + 500 + 70)/\ .036$$

$$P = 80,100 + 21,228$$

$$P = 101,328 \quad (105,000 \text{ rounded})$$

APPENDIX E (continued)

Des Moines

$P = 56,600\ (2.9-2) + (.025(13,367) + 270 + 950)/.038$

$P = 50,940 + 40,899$

$P = 91,839$ (95,000 rounded)

Baltimore

$P = 34,000\ (2.0-1) + (.025(21,980) + 500 + 60)/.024$

$P = 34,000 + 46,229$

$P = 80,229$ (85,000 rounded)

Columbus

$P = 72,100\ (2.8-1.0) + (.03(23,116) + 375 + 50)/.035$

$P = 129,780 + 31,957$

$P = 161,737$ (165,000 rounded)

Denver

$P = 19,600\ (2.3-1.0) + (.03(6966) + 500 + 200)/.04125$

$P = 25,480 + 22,036$

$P = 47,516$ (50,000 rounded)

Memphis

$P = 106,000\ (2.8-1.0) + (.03(12,000) + .02(17,853) + 15)/.04125$

$P = 190,800 + 17,747$

$P = 208,547$ (210,000 rounded)

Portland

P = 20,800 (.4) + [.02(8270) + 70]/.04537

P = 8,320 + 5,188

P = 13,508 (15,000 rounded)

Rockford

P = 21,600 (2.9) + [.03(6726) + 375 + 50],

P = 62640 + 17908

P = 80,540 (85,000 rounded)

Springfield

P = 43,500 (2.9-1.0) + [.03(17,104) + 2500

P = 82,650 + 97,162

P = 179,812 (180,000 rounded)

Stockton

P = 17,500 (1.8) + [.021(4433) + 1000 + 10

P = 31,500 + 26,294

P = 57,794 (60,000 rounded)

Syracuse

P = 32,500 (1.6) + [.03(15,385) + 500 + 80

P = 52,000 + 42,339

P = 94,339 (95,000 rounded)

APPENDIX E (continued)

Based upon the information developed above, the present system cost summary contained on page one is developed. The Annual Cash Receipts column is merely provided data, while the Imprest Balance column is a result of the calculation of P in the formulations above. The Additional Wire Delay column is a result of dividing Annual Cash Receipts by 365 days which results in the value of one days receipts. Present banking agreements of Massey Ferguson allows for a one day (not business day) delay before wire transfers are made. Cash in transit is the float calculation per each bank and when added to the Impressed Balance and Wire Transfer funds represents the Total Cash in the System. These funds which are tied up in the system must be considered a cost to the Company since they are unusable, and are therefore multiplied by the Company's Effective Interest Rate of 10.3% as developed in Table 2. An additional Company cost for processing of cash receipts as developed above complete the summary.

This same method of analysis was used in developing the summaries for all alternates tested and presented in Chapter 4's Tables 3 - 16, and for the Direct Wire Change calculations summarized on the last page of this Appendix.

APPENDIX E (continued)

PRESENT BANK STRUCTURE WITH DIRECT WIRE TRANSFER CHARGES

Bank Location	Annual Cash Receipts (000)	Predetermined Balance			Cash in Transit-Mail Time	Total Cash in System	Company Costs			
		Imprest Balance	Add'l Wire Delay	Total			Interest	Cash Processing	Other Bank Charges	Total
Dallas	$ 15771	$ 115000	$ 43200	$ 158200	$ 82100	$ 240300	$ 24600	$ 2200	$ 300	$ 27100
Kansas City	16401	90000	44900	134900	92200	227100	23300	2100	600	26000
Atlanta	29234	125000	80100	205100	167600	372700	38000	3000	400	41400
Minneapolis	16250	90000	44500	134500	80800	215300	22100	1800	500	24400
Des Moines	20655	85000	133200	198200	106700	304900	31300	2100	300	33700
Baltimore	12411	60000	34000	94000	78500	172500	17700	2600	500	20800
Columbus	26322	155000	72100	227100	174000	401100	41100	2700	400	44200
Denver	7138	40000	19600	59600	37300	96900	9900	1700	500	12100
Memphis	38670	210000	106000	316000	217300	533300	54700	3200		57900
Portland	7601	15000		15000	37900	52900	5400	1700		7100
Rockford	7889	70000		70000	43700	113700	11700	1600	400	13700
Springfield	15886	100000	43500	143500	83500	227000	23300	2300	2500	28100
Stockton	6370	40000		40000	39700	79700	8200	1500	1000	10700
Syracuse	8573	75000	32500	107500	57400	164900	16900	2200	500	19600
Add .15 add'l float					138600	138600	14200			14200
	$229171	$1270000	$633600	$1903600	$1437300	$3340900	$342400	$30700	$7900	$381000